

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARKEMA INC. AND ARKEMA FRANCE,
Petitioner,

v.

HONEYWELL INTERNATIONAL INC.,
Patent Owner.

Case PGR2016-00011
Case PGR2016-00012¹
Patent 9,157,017 B2

Before MICHAEL P. TIERNEY, *Vice Chief Administrative Patent Judge*,
GRACE KARAFFA OBERMANN, and KRISTI L. R. SAWERT,
Administrative Patent Judges.

SAWERT, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 328(a) and 37 C.F.R. § 42.208

¹ Because resolution of issues common to both post-grant reviews resolves the outstanding disputes between the parties as to all challenged claims of the patent at issue, we exercise our discretion to issue a single Final Written Decision to be entered in each case.

I. INTRODUCTION

In these post-grant reviews designated PGR2016-00011 (“PGR11”) and PGR2016-00012 (“PGR12”), Arkema Inc. and Arkema France (collectively, “Petitioner”) challenge the patentability of claims 1–20 of U.S. Patent No. 9,157,017 B2 (Ex. 1001², “the ’017 patent”), assigned to Honeywell International Inc. (“Patent Owner”). We have jurisdiction under 35 U.S.C. § 6. For the reasons discussed below, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–20 (“the challenged claims”) are unpatentable. This Final Written Decision is issued pursuant to 35 U.S.C. § 328(a) and 37 C.F.R. § 42.208.

A. Procedural History

Petitioner filed two Corrected Petitions for post-grant review of claims 1–20 of the ’017 patent. PGR11 Paper 3 (“PGR11 Pet.”); PGR12 Paper 7 (“PGR12 Pet.”). On September 2, 2016, pursuant to 35 U.S.C. § 324, we instituted post-grant reviews of claims 1–20 of the ’017 patent on certain grounds of unpatentability alleged in the Petitions. See PGR11 Paper 13 (“PGR11 Dec. on Inst.”); PGR12 Paper 13 (“PGR12 Dec. on Inst.”).

After institution, Patent Owner filed Patent Owner Responses. See PGR11 Paper 24 (“PGR11 Resp.”); PGR12 Paper 22 (“PGR12 Resp.”). And Petitioner filed Replies. PGR11 Paper 31 (“PGR11 Reply”); PGR12 Paper 27 (“PGR12 Reply”). In PGR11, both parties filed motions to exclude evidence, and the briefing on those motions included oppositions and

² Unless otherwise noted, all exhibits referenced in this Decision were entered into the record in both PGR11 and PGR12. For ease of reference, we refer to the exhibits filed in PGR12 only unless otherwise noted.

replies. See PGR11 Papers 36, 38, 41, 42, 45, 47, 50, 51, 52. Also in PGR11, Patent Owner filed Observations on Statements in Petitioner's Reply following Board authorization. PGR11 Paper 40.

The Board held a consolidated oral hearing on June 7, 2017. A transcript has been entered into the record. PGR11 Paper 53; PGR12 Paper 33 ("Tr.").

B. Related Matters

Petitioner filed a Corrected Petition for *inter partes* review of the '017 patent on February 26, 2016. The Board denied institution on the grounds presented in that Petition. *Arkema Inc. v. Honeywell Int'l Inc.*, Case IPR2016-00643 (PTAB Sept. 2, 2016) (Paper 11). In addition, both parties identify several proceedings in the United States and in the United States Patent and Trademark Office ("Office") involving the '017 patent and patents related to the '017 patent, as well as several proceedings in other countries involving foreign counterparts to the '017 patent and its related patents. PGR11 Pet. 3–7; PGR12 Pet. 2–3; PGR11 Paper 11, 1–4; PGR12 Paper 11, 1–4.

C. The '017 Patent

The '017 patent, titled "Compositions Containing Fluorine Substituted Olefins and Methods and Systems Using Same," is directed to "the use of fluorine substituted olefins, including tetra- and penta-fluoropropenes, in a variety of applications." Ex. 1001 (Abstract). Those applications, according to the '017 patent, include "methods of depositing catalyst on a solid support, methods of sterilizing articles, cleaning methods and compositions, methods of applying medicaments, fire extinguishing/suppression

compositions and methods, flavor formulations, fragrance formulations, and inflating agents.” *Id.* The written description of the ’017 patent states that a preferred use of the disclosed fluorine substituted olefins is in “refrigeration systems, and [in] methods and systems utilizing such compositions.” *Id.* at 1:30–32.

The ’017 patent explains that “[c]oncern has increased in recent years about potential damage to the earth’s atmosphere and climate” from “certain chlorine-based compounds” such as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). *Id.* at 2:1–6. The ’017 patent states that these compounds are widely used in air-conditioning and refrigeration systems, but have become “disfavored because of the ozone-depleting properties.” *Id.* at 2:6–9. Thus, the ’017 patent explains, there is “an increasing need for new fluorocarbon and hydrocarbon compounds and compositions” for refrigeration. *Id.* at 2:9–12. In particular, “it has become desirable to retrofit chlorine-containing refrigeration systems by replacing chlorine-containing refrigerants with non-chlorine-containing refrigerant compounds that will not deplete the ozone layer.” *Id.* at 2:12–16.

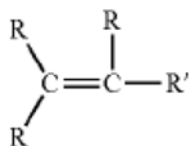
But, the ’017 patent teaches, “any potential substitute refrigerant must also possess the properties present in many of the most widely used fluids,” including “excellent heat transfer properties, chemical stability, low- or no-toxicity, non-flammability and lubricant compatibility.” *Id.* at 2:17–22. Of these properties, lubricant compatibility and flammability are especially important properties. *Id.* at 2:23–24 & 52–53. Lubricant compatibility (or miscibility) “is of particular importance,” the ’017 patent explains, in that the substitute refrigerant must be “compatible with the lubricant utilized in

the compressor unit[] used in most refrigeration systems.” *Id.* at 2:23–27. The ’017 patent states that the “lubricant should be sufficiently soluble in the refrigeration liquid over a wide range of operating temperatures.” *Id.* at 2:35–37. Otherwise, the lubricant becomes viscous and “lodge[s] in the coils of the evaporator of the refrigeration, air-conditioning or heat pump system” and “thus reduce[s] the system efficiency.” *Id.* at 2:37–42. As to flammability, the ’017 patent states that “it is considered either important or essential in many applications . . . to use compositions [that] are non-flammable,” particularly in heat-transfer applications. *Id.* at 2:53–56. “Unfortunately,” the ’017 patent teaches, “many HFCs, which might otherwise be desirable for use[] in refrigerant compositions are not nonflammable.” *Id.* at 2:61–63. The ’017 patent lists fluoroalkene 1,1,1-trifluoropropene (HFO-1243zf) as an example of a flammable compound. *Id.* at 2:63–67.

The ’017 patent discloses “compositions comprising one or more C3 or C4 fluoroalkenes, preferably compounds having Formula I as follows:



where X is a C₂ or a C₃ unsaturated, substituted or unsubstituted, alkyl radical, each R is independently Cl, F, Br, I or H, and z is 1 to 3.” *Id.* at 3:40–50. The ’017 patent states that these compositions, referred to as “hydrofluoro-olefins or ‘HFOs,’” “satisf[y]” the “above-noted need[s].” *Id.* at 3:42–43; 4:1–2. The ’017 patent states that preferred compositions include compounds of Formula II, depicted below:



(II)

“where each R is independently Cl, F, Br, I or H[,] R’ is (CR₂)_nY, Y is CRF₂[,] and n is 0 or 1.” *Id.* at 4:10–21. The ’017 patent states that “applicants have surprisingly and unexpectedly found that certain of the compounds having a structure in accordance with the[se] formulas . . . exhibit a highly desirable low level of toxicity compared to other of such compounds” of Formulas I and II. *Id.* at 4:29–33.

The ’017 patent then describes the preferred compounds of Formula I and Formula II. First, the ’017 patent states that “applicants believe that a relatively low toxicity level is associated with compounds of Formula II, *preferably* wherein Y is CF₃, wherein at least one R on the unsaturated terminal carbon is H, and at least one of the remaining R [groups] is F.” *Id.* at 4:38–42 (emphasis added). Next, the ’017 patent states that in “*highly preferred embodiments*,” “n is zero” and “the unsaturated terminal carbon has not more than one F substituent.” *Id.* at 4:45–48 (emphasis added). These compounds, the ’017 patent states, “have a very low acute toxicity level.” *Id.* at 4:48–50. Finally, the ’017 patent states that, in “*certain highly preferred embodiments*,” the compositions “comprise one or more tetrafluoropropenes” (referred to as “HFO-1234”). *Id.* at 4:50–54.

Among the tetrafluoropropenes, the ’017 patent identifies HFO-1234ze (cis- and trans-1,3,3,3-tetrafluoropropene) as “particularly preferred.” *Id.* at 4:54–63. The ’017 patent states that “the present

compositions, particularly those comprising HFO-1234ze,” are believed to “not have a substantial negative affect on atmospheric chemistry.” *Id.* at 5:30–36. Specifically, “certain preferred” compositions have a Global Warming Potential (GWP) of “preferably not greater than about 500,” and an Ozone Depletion Potential (ODP) of “not greater than 0.05.” *Id.* at 5:43–58.

Next, the ’017 patent contemplates “Heat Transfer Compositions.” *See id.* at 6:30–7:3.³ The ’017 patent teaches that “it is generally preferred that refrigerant compositions of the present invention comprise compound(s) in accordance with Formula I, more preferably in accordance with Formula II, and even more preferably HFO-1234ze.” *Id.* at 6:34–38. The ’017 patent then states that “[i]n many embodiments, it is preferred that the heat transfer compositions of the present invention comprise transHFO-1234ze.” *Id.* at 6:40–42.

The ’017 patent teaches that the disclosed compounds comprise “at least about 50% by weight” of the heat-transfer compositions. *Id.* at 6:32–40. The ’017 patent also states that the heat-transfer compositions,

³ In addition to heat transfer compositions, the ’017 patent also contemplates “Blowing Agents, Foams and Foamable Compositions” (*id.* at 7:44–8:45), “Propellant and Aerosol Compositions” (*id.* at 8:46–9:63), and “Flavorants and Fragrances” (*id.* at 9:64–10:26). Example 5 of the ’017 patent “illustrates the use of blowing agent in accordance with two preferred embodiments of the present invention,” namely “HFO-1234ze and HFO-1234-yf,” to produce a polystyrene foam. *Id.* at 16:60–67. The ’017 patent reports that “foam polystyrene is obtainable in accordance with the present invention.” *Id.* at 17:18–20.

especially refrigerant compositions used in vapor compression systems, include a lubricant in an amount from about 30% to about 50% by weight of the composition. *Id.* at 6:51–55. The '017 patent explains that lubricants such as polyol esters (POEs) and polyalkylene glycols (PAGs), silicone oil, mineral oil, alkyl benzenes (ABs), and poly(alpha-olefins) (PAOs), which are commonly used in refrigeration machinery with HFC refrigerants, “may be used with the refrigerant compositions of the present invention.” *Id.* at 6:64–7:3.

Next, the '017 patent describes the “drop-in” nature of the heat-transfer compositions. *See id.* at 7:4–43. The '017 patent begins by stating that the “compositions of the present invention are believed to be adaptable for use in many” existing refrigeration systems, “with or without system modification.” *Id.* at 7:4–8. “In many applications,” the '017 patent states, “the compositions of the present invention may provide an advantage as a replacement in systems . . . currently based on refrigerants having a relatively high capacity.” *Id.* at 7:8–11. Specifically, the '017 patent states that the “lower capacity refrigerant composition[s] of the present invention” may “replace a refrigerant of higher capacity.” *Id.* at 7:11–16. The '017 patent exemplifies “embodiments consisting essentially of transHFO-1234ze, as a replacement for existing refrigerants, such as HFC-134a.” *Id.* at 7:16–20. The written description further states that:

The present methods, systems and compositions are thus adaptable for use in connection with automotive air conditioning systems and devices, commercial refrigeration systems and devices, chillers, residential refrigerator and freezers, general air conditioning systems, heat pumps, and the like.

Id. at 7:38–43.

The '017 specification provides several examples. *See id.* at 13:55–17:33. Example 1 is directed to “[a] refrigeration/air conditioning cycle system . . . where the condenser temperature is about 150°F. and the evaporator temperature is about -35°F.” *Id.* at 14:16–18. Table 1 provides the relative coefficient of performance (COP), relative capacity, and discharge temperatures for “several compositions of the present invention,” as compared to “HFC-134a having a COP value of 1.00, a capacity value of 1.00[,] and a discharge temperature of 175°F.” *Id.* at 14:20–24. The '017 patent explains that COP “is a universally accepted measure of refrigerant performance” and represents “the relative thermodynamic efficiency of a refrigerant in a specific heating or cooling cycle” (*id.* at 13:64–14:1), whereas capacity “represents the amount of cooling or heating” a refrigerant provides (*id.* at 14:4–5). “[A] refrigerant with a higher capacity,” the '017 patent explains, “will deliver more cooling or heating power.” *Id.* at 14:8–9. Finally, the '017 patent explains that lower discharge temperatures are “advantageous” and “likely lead[] to reduced maintenance problems.” *Id.* at 14:39–43.

Table 1 is reproduced below:

TABLE I			
REFRIGERANT COMPOSITION	Relative COP	Relative CAPACITY	DISCHARGE TEMPERATURE (° F.)
HFO 1225ye	1.02	0.76	158
HFO trans-1234ze	1.04	0.70	165
HFO cis-1234ze	1.13	0.36	155
HFO 1234yf	0.98	1.10	168

Table 1 of the '017 patent provides the relative COP and relative capacity of several refrigerant compositions HFO-1224ye, HFO-trans-1234ze, HFO-cis-1234ze, and HFO-1234yf.

Id. at 14:25–35. The '017 patent states that “[t]his example shows that *certain of the preferred compounds* for use with the present compositions each have a better energy efficiency than HFC-134a (1.02, 1.04 and 1.13 compared to 1.00).” *Id.* at 14:36–39 (emphasis added). The '017 patent also explains that a compressor using these refrigerants will produce advantageous discharge temperatures (i.e., 158, 165, and 155 compared to 175 for HFC-134a). *Id.* at 14:36–43.

Example 2 of the '017 patent is directed to testing “[t]he miscibility of HFO-1225ye and HFO-1234ze with various refrigeration lubricants.” *Id.* at 14:47–48. Lubricants tested include mineral oil, an alkyl benzene (Zerol 150), two ester oils, a polyalkylene glycol (Goodwrench Refrigeration Oil for 134a systems), and a poly(alpha olefin) oil (CP-6005-100). *Id.* at 14:48–52. According to the written description:

The polyalkylene glycol and ester oil lubricants were judged to be miscible in all tested proportions over the entire temperature range, except that for the HFO-1225ye mixtures with polyalkylene glycol, the refrigerant mixture was found to be immiscible over the temperature range of -50°C . to -30°C . and to be partially miscible over from -20 to 50°C .

Id. at 15:4–9.

Example 3 of the '017 patent focuses on “[t]he compatibility of the refrigerant compounds and compositions of the present invention with PAG lubricating oils while in contact with metals used in refrigeration and air conditioning systems.” *Id.* at 15:15–20. Five combinations were tested: (a) HFO-1234ze and GM Goodwrench PAG oil; (b) HFO-1243zf and GM Goodwrench PAG oil; (c) HFO-1234ze and MOPAR-56 PAG oil; (d) HFO-1243zf and MOPAR-56 PAG oil; and (e) HFO-1225ye with MOPAR-56 PAG oil. The '017 patent reports that the tested compositions were stable in contact with aluminum, steel, and copper. *Id.* at 15:29–43.

D. Illustrative Claims

Independent claims 1 and 12 are illustrative of the challenged claims and are reproduced below:

1. A method for producing an automobile air conditioning system for use with 2,3,3,3-tetrafluoropropene (HFO-1234yf) comprising:
 - (a) providing an automobile vapor compression air conditioning system usable with refrigerant 1,1,1,2-tetrafluoroethane (HFC-134a) and having at least one compressor and at least one condenser; and
 - (b) providing a heat transfer composition in said system, said heat transfer composition consisting essentially of:
 - (i) at least about 50% by weight of a low toxicity refrigerant suitable for use in automobile air conditioning systems, said

refrigerant consisting essentially of HFO-1234yf; and
(ii) lubricant consisting essentially of polyalkylene glycol(s),
and
wherein (1) said condenser is operable with said refrigerant in a
temperature range that includes 150°F. and (2) said system
when operating at a condenser temperature of 150°F.
achieves a capacity relative to HFC-134a of about 1 and a
Coefficient of Performance (COP) relative to HFC-134a of
about 1.

12. A stable heat transfer composition for use in an
automobile air conditioning system of the type having a
condenser operating in a temperature range that includes about
150°F., said heat transfer composition consisting essentially of:
(i) at least about 50% by weight of a low toxicity refrigerant
suitable for use in automobile air conditioning systems, said
refrigerant consisting essentially of 2,3,3,3-
tetrafluoropropene (HFO-1234yf); and
(ii) lubricant consisting essentially of polyalkylene glycol(s),
wherein said refrigerant under the conditions of said condenser
operating at about 150°F. in said automobile air conditioning
system has a capacity relative to HFC-134a of about 1 and a
Coefficient of Performance (COP) relative to HFC-134a of
about 1, and wherein said heat transfer composition is stable
in contact with aluminum, steel and copper.

Id. at 17:35–55, 18:34–53.

E. Prosecution History of the '017 Patent

The '017 patent was filed as U.S. Patent Application No. 14/225,588
("the '588 application") on March 26, 2014. Ex. 1001, [21], [22]. The '588
application claimed the benefit of a series of applications, the earliest of
which constitute two provisional applications (i.e., No. 60/421,263 and No.
60/421,435) filed on October 25, 2002. *Id.* at 1:5–25.

Concurrently with the filing of the '588 application, Patent Owner filed a preliminary amendment cancelling all previous claims and adding new claims directed to the use of a heat-transfer composition consisting essentially of HFO-1234yf and PAG lubricant in automobile air conditioning ("AAC"). Ex. 1047, 3–6. After receiving a first office action rejecting the claims for double patenting and obviousness (*see* PGR12 Ex. 1048, 3–9), Patent Owner submitted a response providing a "Summary of the Claimed Subject Matter" (Ex. 1049, 6–7). In that Summary, Patent Owner stated that the invention is "directed to a specific heat transfer application, namely automotive air conditioning, having a combination of stringent and unique technical requirements, including numerous properties and characteristics that are not predictable." Ex. 1049, 6–7. Patent Owner further informed the Office that "[t]he field of automotive air conditioning is a distinct technical field within the broader, general field of heating and cooling applications." *Id.* at 7. And "[a]s such, automotive air conditioning has specific technical requirements as compared to other heating and cooling applications, including stationary air conditioning." *Id.*

Patent Owner identified those "specific technical requirements" as including: (1) strict prohibitions on the use of toxic refrigerant materials "due to the confined, sealed, low volume air space" in AAC; (2) strict restrictions on compressor size, which, in turn, "plac[es] restrictions on refrigerant capacity and COP"; (3) the ability to effectively operate at high condenser temperatures that form "in the heat-trapping engine compartment"; (4) restrictions on refrigerant flammability "due to the confined, sealed, low volume air space" in AAC; and (5) high stability "in

view of the need for the use of flexible hoses” in AAC. *Id.* at 7–8.

Patent Owner explained that the “specific characteristics of an automotive air conditioning system emphasi[z]e that automotive air conditioning is a distinct, select, technical field.” *Id.* at 12. The specific technical requirements also “necessarily have a significant impact on the properties required, and increase the difficulty and unpredictability of choosing an effective heat transfer fluid for use in an automotive air conditioning system.” *Id.* “[T]herefore,” Patent Owner concluded, “a skilled artisan would not conclude that a heat transfer fluid disclosed as suitable for heating or cooling generally would necessarily, or obviously, be suitable for use in automotive air conditioning.” *Id.* at 12–13; *see also id.* at 8 (stating that “a person of ordinary skill in the art would not simply expect that a material used as a refrigerant in applications other than automotive air conditioning would be useful in automotive air conditioning”).

Patent Owner explained that the claimed subject matter met these technical requirements and also provided “acceptable and effective refrigerant/lubricant miscibility for use without an oil separator,” “dramatically superior Global Warming Potential,” and “an Ozone Depletion Potential (ODP) close to zero.” *Id.* at 13–14. Patent Owner informed the Office that the claimed subject matter proceeded in a direction opposite to conventional teachings “in a very unpredictable art” (*id.* at 13), and that “those skilled in the art simply had no basis for making the selections the inventors here made” (*id.* at 14).

Among other things, Patent Owner stated that the claimed subject matter provided an unexpectedly safe air conditioning system having low

flammability, superior stability, and low toxicity. *Id.* at 20–24. As to flammability, Patent Owner stated that, “[u]npredictably and unexpectedly, HFO-1234yf[] has a burning velocity 11.5 times below the burning velocity of HFO-1243zf, which is acceptable for use in automobile air conditioning.” *Id.* at 22 (emphasis omitted). And as to stability, Patent Owner stated that “[t]he extraordinary stability of the combination of HFO-1234yf with PAG is simply not something that could have been predicted or expected.” *Id.* at 24. Further, Patent Owner represented that the drop-in nature of HFO-1234yf was also “an unexpected and highly advantageous property.” *Id.* at 25.

Finally, in another response to a subsequent office action, Patent Owner wrote that “the Examiner has acknowledged the prior arguments pointing out that the claims are directed to the special field of automotive air conditioning and has indicated that the argument may eventually provide a path to patentable subject matter.” Ex. 1050, 7. Patent Owner also wrote that “the Examiner [has] acknowledged that toxicity is a more important consideration in automotive air conditioning than in other refrigeration applications.” *Id.*

F. Asserted Grounds of Unpatentability

In PGR11, we instituted post-grant review of claims 1–20 of the ’017 patent on the ground of unpatentability, under 35 U.S.C. § 103, over

Inagaki⁴ in view of Tapscott,⁵ Uemura,⁶ and Magid.⁷ PGR11 Dec. on Inst. 30.

In PGR12, we instituted post-grant review on four grounds: (1) claims 1–20 on the ground of unpatentability for prior public use under 35 U.S.C. § 102(a); (2) claims 1–12 and 14–20 on the ground of unpatentability for anticipation under 35 U.S.C. § 102(a) by WO '625;⁸ (3) claims 1–20 on the ground of unpatentability for obviousness over Minor & Spatz⁹ in view of the '882 patent;¹⁰ and (4) claim 13 on the ground of unpatentability for lack of enablement under 35 U.S.C. § 112(a). PGR12 Dec. on Inst. 36.

⁴ Sadayasu Inagaki, et al., English Translation of Japanese Patent Application No. JP H4-110388 (published Apr. 10, 1992) (“Inagaki”). PGR11 Ex. 1012.

⁵ Robert E. Tapscott & J. Douglas Mather, *Tropodegradable fluorocarbon replacements for ozone-depleting and global-warming chemicals*, J. FLUORINE CHEM., 101:209–303 (2000) (“Tapscott”). PGR11 Ex. 1015.

⁶ S. Uemura, et al., *Characteristics of HFC Refrigerants*, INT’L REFRIGERATION & AIR CONDITIONING CONFERENCE, Paper 177 (1992) (“Uemura”). PGR11 Ex. 1014.

⁷ Hillel Magid, et al., U.S. Patent No. 4,755,316 (issued July 5, 1988) (“Magid”). PGR11 Ex. 1008.

⁸ Rajiv R. Singh, et al., WO 2007/002625 A2 (published Jan. 4, 2007) (“WO '625”). PGR12 Ex. 1011.

⁹ Barbara Minor & Mark Spatz, *HFO-1234yf Low GWP Refrigerant Update*, INT’L REFRIGERATION & AIR CONDITIONING CONFERENCE, Paper 937 (2008) (“Minor & Spatz”). PGR12 Ex. 1010.

¹⁰ Rajiv R. Singh, et al., U.S. Patent No. 8,065,882 B2 (issued Nov. 29, 2011) (“the '882 patent”). PGR12 Ex. 1009.

In its patentability challenges in both PGR11 and PGR12, Petitioner relies on the Declarations of J. Steven Brown, Ph.D. (Ex. 1002) and William J. Brock, Ph.D. (Ex. 1004). In its responses, Patent Owner relies on the Declaration of Donald Bivens dated June 6, 2016 (Ex. 2001), two Declarations of Donald Bivens dated December 15, 2016 (PGR11 Ex. 2126, PGR12 Ex. 2126)¹¹, the Declaration of Margaret H. Whittaker, Ph.D. (PGR11 Ex. 2094), and the Declaration of Darryl DesMarteau, Ph.D. (PGR11 Ex. 2161).

II. DISCUSSION

The parties dispute whether the '017 patent is eligible for post-grant review. Petitioner asserts that the '017 patent is eligible for post-grant review because its claims are not supported by a pre-March 16, 2013 priority application, and thus are limited to an effective filing date of March 26, 2014, i.e., the actual filing date of the '588 application. PGR11 Pet. 28–30; PGR12 Pet. 20–22. According to Petitioner, none of Patent Owner's earlier-filed priority applications describe or enable the claimed subject matter of an AAC refrigerant composition consisting essentially of HFO-1234yf in combination with a lubricant consisting essentially of PAG in accordance with 35 U.S.C. § 112(a). PGR11 Pet. 31–43; PGR12 Pet. 24–36. Patent Owner challenges Petitioner's assertions. PGR11 Resp. 24; PGR12 Resp. 23–60. Before turning to this issue, we briefly address claim interpretation

¹¹ For clarity, we note that Dr. Bivens' December Declaration filed in PGR11 is not identical to Dr. Bivens' December Declaration filed in PGR12, even though both of these Declarations are entered into their respective records as Exhibit 2126.

and the level of ordinary skill in the art and field of invention.

A. Claim Interpretation

In a post-grant review, the Board interprets claim terms in an unexpired patent according to the broadest reasonable interpretation in light of the specification of the patent in which they appear. 37 C.F.R. § 42.200(b). We determine that no claim terms require express interpretation for purposes of this Decision. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy).

B. Level of Ordinary Skill in the Art and Field of Invention

The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the types of problems encountered in the art, the sophistication of the technology, and the educational level of active workers in the field. *Id.*

Petitioner's Declarant, Dr. Brown, testifies that, a person of ordinary skill in connection with the '017 patent is one who evaluates, designs, and develops new refrigerants for use as heat transfer fluids. Ex. 1002 ¶ 149. Such a person would have had a Ph.D. in Chemistry, Chemical Engineering, Mechanical Engineering, Material Science, or a related field or discipline and at least 3 to 5 years of experience, or alternatively an M.S. degree and 5 to 10 years of experience. *Id.* Patent Owner's Declarant, Dr. Bivens,

provides a similar description of the person of ordinary skill in the art, stating that such a person would have a B.S. degree in Chemical Engineering or Chemistry, and five years of work experience, or a Ph.D. or M.S. degree and 2–3 years of experience. Ex. 2001 ¶ 23.

Based on these descriptions, we find that the parties' definitions of ordinary skill in the art are substantially the same, and agree with the parties that an ordinarily skilled artisan would be educated in the Chemical and Chemical Engineering arts or related disciplines. We also agree with the parties that a person having less formal education, such as a B.S. or M.S. degree, would require more years of experience than a person with more formal education, such as a Ph.D., to qualify as an ordinarily skilled artisan.

We also find that neither party states how any difference in the parties' articulated levels of skill impacts this proceeding. Thus, our analysis would be the same regardless of any minor differences between the parties' respective articulations. Finally, we note that the level of ordinary skill in the art is reflected by the prior art of record. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself can reflect the appropriate level of ordinary skill in the art).

Turning to the relevant technology, we find that the field of invention is directed to the field of AAC. First, we observe that every claim of the '017 patent recites AAC. Specifically, independent claim 1 is directed to a method for producing an AAC system; independent claim 6 is directed to a method of conditioning the air in an automobile using an AAC system; independent claim 12 is directed to a stable heat transfer composition for use in an AAC system; and independent claim 19 is directed a method for

cooling air in an automobile by providing a low-toxicity refrigerant suitable for use in AAC systems. *See* Ex. 1001, col. 17:34–19:25. Second, we credit and rely on Patent Owner’s statements made during prosecution that AAC represents “a distinct technical field within the broader, general field of heating and cooling applications,” and that AAC “has specific technical requirements as compared to other heating and cooling applications.” Ex. 1049, 7–9; *see also* Ex. 1002 ¶¶ 182, 217, 244. Thus, we also find that the field of invention—AAC—is narrower than refrigeration methods, systems, and compositions generally.

C. Post-Grant Review Eligibility

The parties dispute whether the ’017 patent is eligible for post-grant review. As discussed below, this dispute turns on whether the ’017 patent contains any one claim having an effective filing date on or after March 16, 2013. The Petitioner bears the burden of proving by a preponderance of the evidence that the ’017 patent is subject to the first-inventor-to-file provisions of the AIA and eligible for post-grant review. *US Endodontics, LLC v. Gold Standard Instruments, LLC*, Case PGR2015-00019, slip op. at 9–10 (PTAB Dec. 28, 2016) (Paper 54).

1. Legal Standards

The post-grant review provisions set forth in Section 6(d) of the AIA¹² apply only to patents subject to the first-inventor-to-file provisions of the AIA. *See* AIA § 6(f)(2)(A) (“The amendments made by subsection (d) . . . shall apply only to patents described in section 3(n)(1).”). Patents subject to

¹² Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”).

the first-inventor-to-file provisions are those that issue from applications “that contain[] or contained at any time . . . a claim to a claimed invention that has an effective filing date as defined in section 100(i) of title 35, United States Code, that is on or after” March 16, 2013. AIA § 3(n)(1). Our rules require that each petitioner for post-grant review certify that the challenged patent has an effective filing date that renders the patent available for post-grant review. 37 C.F.R. § 42.204(a) (“The petitioner must certify that the patent for which review is sought is available for post-grant review . . .”).

The “effective filing date” of an application for a patent on an invention is “the filing date of the earliest application for which the . . . application is entitled, as to such invention, to a right of priority under section 119, 365(a), or 365(b) or to the benefit of an earlier filing date under section 120, 121, or 365(c).” 35 U.S.C. § 100(i)(1)(B). In the event that the application is not entitled to any earlier filing date or right of priority, the effective filing date is “the actual filing date of the . . . application for the patent containing a claim to the invention.” *Id.* § 100(i)(1)(A). Entitlement to the benefit of an earlier date under §§ 119, 120, 121, and 365 is premised on disclosure of the claimed invention “in the manner provided by § 112(a) (other than the requirement to disclose the best mode)” in the earlier application. *See* 35 U.S.C. §§ 119(e), 120.

Applying these statutes to determine whether a patent is subject to the first-inventor-to-file provisions of the AIA (and therefore eligible for post-grant review) is straightforward when the application from which the patent issued was filed before March 16, 2013, or when the application was filed on or after March 16, 2013, without any priority claim. The determination is

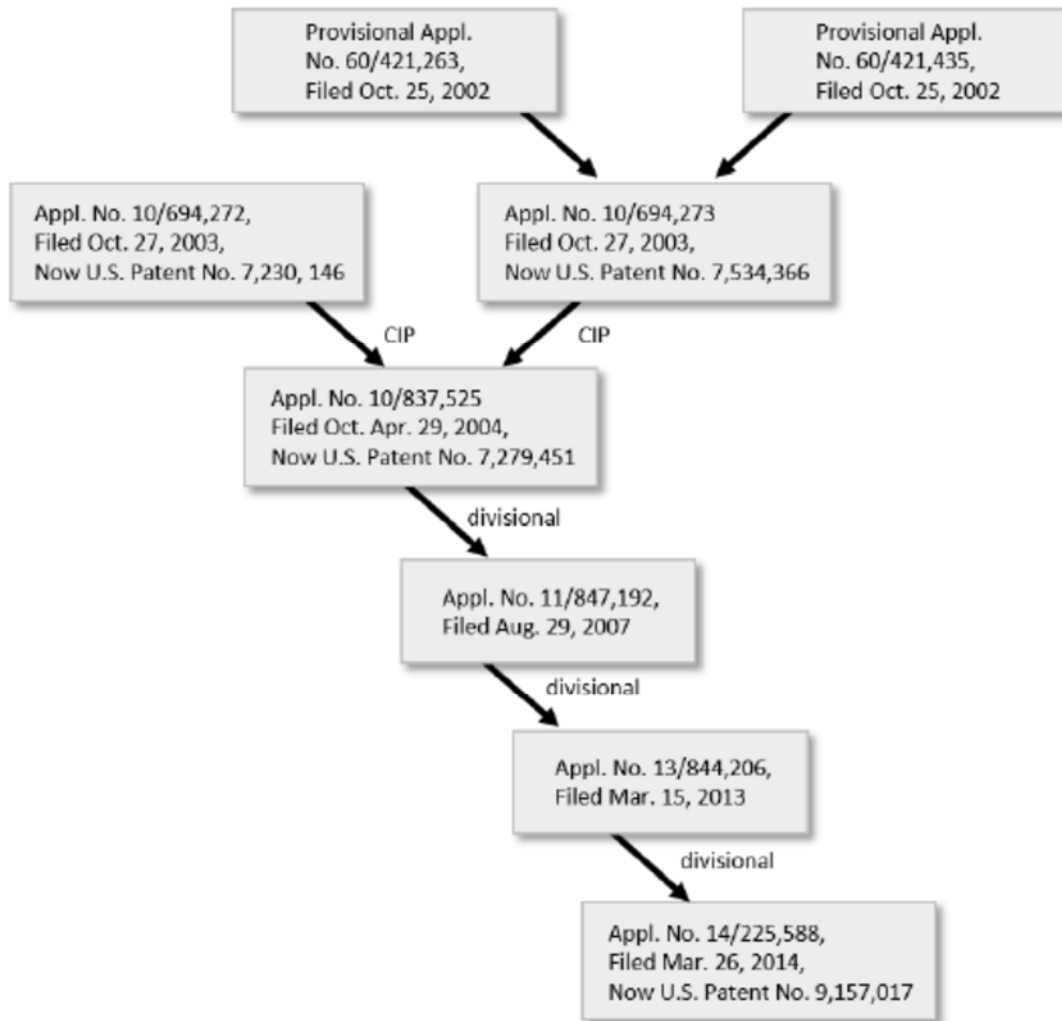
more complex, however, for a patent that issues from a “transition application,” which is an application filed on or after March 16, 2013 that claims the benefit of an earlier filing date before March 16, 2013. As a consequence of the statutes discussed above, a patent that issues from a transition application is available for post-grant review “if the patent contains . . . at least one claim that was not disclosed in compliance with the written description and enablement requirements of § 112(a) in the earlier application for which the benefit of an earlier filing date prior to March 16, 2013 was sought.” *Inguran, LLC v. Premium Genetics (UK) Ltd.*, Case PGR2015-00017, slip op. at 11 (PTAB Dec. 22, 2015) (Paper 8).¹³

Because the ’017 patent issued from a transition application, its eligibility for post-grant review hinges on whether the Petitioner has shown, by a preponderance of the evidence, that any one of claims 1–20 lacks adequate written description support or is not adequately enabled by an application filed before March 16, 2013, to which the ’017 patent claims priority.

¹³ Separate from the requirement that the patent is subject to the AIA’s first-inventor-to-file provisions, an additional requirement for post-grant review eligibility is that “[a] petition for a post-grant review may only be filed not later than the date that is 9 months after the date of the grant of the patent.” 35 U.S.C. § 321(c); *see* 37 C.F.R. § 42.202(a). Here, Patent Owner does not dispute that the Petitions were filed within the nine month filing deadline. *See generally* PGR11 Resp. 24; PGR12 Resp. 23–24. Nor does Patent Owner dispute Petitioner’s representation that Petitioner is not barred or estopped from requesting post-grant review of the ’017 Patent. *See id.*

2. Priority Documents

Patent Owner provides a schematic representation of the series of applications leading to the '017 patent, and to which the '017 patent claims priority. PGR12 Resp. 25. We find the schematic useful for understanding the priority chain and reproduce it below:



A schematic representation of the series of applications leading to the '017 patent.

The '588 application, which issued as the '017 patent, was filed on March 26, 2014. Ex. 1001, [22], [22]. The '588 application claimed the benefit of a series of divisional and continuation-in-part (CIP) applications, as well as two provisional applications (i.e., No. 60/421,263 and No. 60/421,435) filed on October 25, 2002. *Id.* at 1:5–25. Specifically, Patent Owner states that the '017 patent is a divisional of U.S. Patent Application No. 13/844,206 (“the '206 application”), filed on March 15, 2003, which in turn is a divisional of U.S. Patent Application No. 11/847,192 (“the '192 application”), filed on August 29, 2007, which in turn is a divisional of U.S. Patent Application No. 10/837,525 (“the '525 application”), filed on April 29, 2004. The '525 application issued as U.S. Patent No. 7,279,451 (“the '451 patent”). PGR12 Resp. 23–24; *see also* Ex. 1001, 1:5–25. Patent Owner states that the '451 patent is a continuation-in-part of two applications: U.S. Patent Application No. 10/694,272, filed October 27, 2003 (now issued as U.S. Patent No. 7,230,146), and U.S. Patent Application No. 10/694,273, also filed on October 27, 2003 (now issued as U.S. Patent No. 7,753,366). Ex. 1001, 1:5–25.

Petitioner states that “the specifications of the '017 patent’s three immediately prior applications . . . are all substantively identical.” PGR11 Pet. 32–33 n.5; PGR12 Pet. 25 n.3. Patent Owner agrees, stating that, “[a]s a divisional application, the '017 patent has the same specification as the '206 and '192 applications and the ['525 application].” PGR12 Resp. 24. Consistent with these characterizations, we find it undisputed that the specification of the '017 patent is substantially identical to the specifications of the '206, '192, and '525 applications.

3. Analysis of Post-Grant Review Eligibility

As explained above, the “effective filing date” of an application for a patent on an invention is “the filing date of the earliest application for which the . . . application is entitled, as to such invention.” 35 U.S.C. § 100(i)(1). To be entitled to the filing date of an earlier application, the earlier application must disclose the claimed invention “in the manner provided by § 112(a) (other than the requirement to disclose the best mode).” 35 U.S.C. §§ 119(e), 120.

Petitioner argues that the claims of the ’017 patent have an effective filing date of March 26, 2014, which is the actual filing date of the ’588 application. PGR11 Pet. 28; PGR12 Pet. 20. Specifically, Petitioner contends that the claims of the ’017 patent “are not supported or enabled” under 35 U.S.C. § 112(a) “by any prior application filed before the March 26, 2014, filing date of” the ’588 application. PGR11 Pet. 29–30; PGR12 Pet. 22. Thus, according to Petitioner, claims 1–20 of the ’017 patent have an effective filing date after March 16, 2013, and therefore are subject to the first-inventor-to-file provisions of the AIA and eligible for post-grant review. PGR11 Pet. 1; PGR12 Pet. 1.

Petitioner’s argument accords with the definition of “effective filing date” set forth above, which provides in subparagraph (B) that the effective filing date is the filing date of the earliest application to which the patent is entitled to priority or to the benefit of an earlier filing date. 35 U.S.C. § 100(i)(1)(B). Subparagraph (A) provides that “if subparagraph (B) does not apply,” the effective filing date is the actual filing date of the patent containing a claim to the invention. 35 U.S.C. § 100(i)(1)(A). Under the

subparagraph (A) definition of “effective filing date,” if any claim in a patent application is not entitled to an earlier filing date, then subparagraph (B) does not apply, and the effective filing date is the actual filing date of the application, regardless of whether the disclosure in the application is sufficient to support the claim. Consequently, we agree with Petitioner that, if any one of claims 1–20 is not entitled to an effective filing date before March 16, 2013, then the effective filing date for that claim is the actual filing date of the ’588 application, i.e., March 26, 2014.

We confine our analysis to whether the disclosure of the ’525 application—which is the first application in the priority chain that includes an explicit reference to AAC—supports the challenged claims. *See* PGR11 Pet. 33; PGR12 Pet. 25–26; PGR12 Resp. 25. Although Patent Owner briefly states that “[t]he ’017 patent’s claims find adequate written description and enablement support under 35 U.S.C. § 120 in applications filed as early as 2002,” Resp. 23, Patent Owner makes no credible substantive argument that any of these earlier-filed applications (i.e., the 2002 provisional applications and the 2003 patent applications) adequately support the claims of the ’017 patent. Instead, Patent Owner only makes substantive arguments with respect to the ’451 patent (i.e., the ’525 application), filed on April 29, 2004, which shares the same specification as the ’017 patent. *See generally* Resp. 25–57. Also, Patent Owner makes no credible separate argument that any of the later-filed applications (i.e., the ’206 application filed in 2013 and the ’192 application filed in 2007) provide support beyond that provided by the ’525 application. *Id.* Thus, on this record, we determine that Patent Owner has waived any argument that the

'206 and '192 applications provide adequate § 112(a) support for the claims of the '017 patent even if the '525 application lacks adequate § 112(a) support.¹⁴

(a) Written Description

Section 112(a) requires that the specification contain a written description of the claimed invention. 35 U.S.C. § 112(a). “[T]he hallmark of written description is disclosure.” *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (*en banc*). The written description requirement is met when the specification “conveys to those skilled in the art that the inventor had possession of” and “actually invented” the claimed subject matter. *Id.* The purpose of the written description requirement is to ensure that a patent’s claims “do[] not overreach the scope of the inventor’s contribution to the field of art as described in the patent specification.” *Reiffin v. Microsoft Corp.*, 214 F.3d 1342, 1345 (Fed. Cir. 2000).

“To obtain the benefit of the filing date of a parent application, the claims of the later-filed application must be supported by the written description in the parent ‘in sufficient detail that one skilled in the art can clearly conclude that the inventor invented the claimed invention as of the filing date sought.’” *Anascape, Ltd. v. Nintendo of Am. Inc.*, 601 F.3d 1333,

¹⁴ For ease of reference, we cite to Ex. 1001 as representing the written description of the '525 application ('451 patent), with the understanding that the citations equally apply to the '206 and '192 applications, as well as to the specification of the '017 patent (or '588 application). We note that Petitioner also cites to Ex. 1001 in its analysis, whereas Patent Owner cites to the '451 patent, which issued from the '525 application. *See, e.g.*, PGR12 Resp. 27 (citing Exhibit 1021).

1335 (Fed. Cir. 2010) (quoting *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997)). Without written description support, claims containing new matter are unpatentable under § 112(a). *Ariad*, 598 F.3d at 1348. This required compliance with § 112(a) ensures that the applicant fully possessed the entire scope of the claim as of the original filing date. *TurboCare Div. of Demag Delaval Turbomachinery Corp. v. Gen. Elec. Co.*, 264 F.3d 1111, 1118 (Fed. Cir. 2001).

The test for adequate written description support “requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.” *Ariad*, 598 F.3d at 1351. Although the specification need not recite the claimed invention *in haec verba*, a description that merely renders the invention obvious does not satisfy the written description requirement. *Id.* at 1352. Instead, “[i]t is the disclosures of the applications that count. Entitlement to a filing date does not extend to subject matter which is not disclosed, but would be obvious over what is expressly disclosed. It extends only to that which is disclosed.” *Lockwood*, 107 F.3d at 1571–72.

“The level of detail required to satisfy the written description requirement” necessarily “varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology.” *Ariad*, 598 F.3d at 1351. But a “mere wish or plan” for obtaining the claimed subject matter also does not satisfy the written description requirement. *Regents of the Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559, 1566 (Fed. Cir. 1997).

(1) Summary of the Parties' Contentions

The thrust of Petitioner's argument is that the '525 application does not describe "the combination of HFO-1234yf plus PAG for use in AAC." PGR12 Pet. 24–25 (citing Ex. 1002 ¶¶ 190–213, 221–225, 234–245). Petitioner contends that, in the '525 application, "the *only* reference to AAC states that '[t]he present methods, systems and compositions *are thus adaptable for use* in connection with [AAC].'" *Id.* at 26 (citing Ex. 1001, 7:38–40). Petitioner asserts that "[t]his mere passing reference to AAC lacks disclosure or guidance as to how one would adapt for use in connection with AAC." *Id.* (citing Ex. 1002 ¶¶ 167, 241) (quotation and alteration omitted). Petitioner argues that, "at best, *adaptable for use* provides a mere wish or plan . . . for obtaining or makes obvious to try the now-claimed invention." *Id.* (quotation omitted). Petitioner also points to Patent Owner's "repeated representations [during prosecution], to distinguish over the prior art, that AAC is a 'distinct technical field,' having 'specific technical requirements as compared to other heating and cooling applications, including statutory air conditioning.'" *Id.* (quoting Ex. 1049, 7, 12; citing Ex. 1050, 8–9; Ex. 1002 ¶ 241). "Without support for AAC in the '525 application," Petitioner concludes, "priority for the '017 patent claims can be no earlier than the filing of the March 26, 2014, preliminary amendment." *Id.*

Patent Owner counters that the '525 application "describes not only the individual components of HFO-1234yf, PAG lubricant, and automobile air conditioning, but also discloses their combination." PGR12 Resp. 26. Patent Owner argues that the disclosure of the '525 application "explicitly

directs skilled artisans to use the disclosed compositions in automotive air conditioning, saying that its ‘methods, systems and compositions are thus adaptable for use in,’ *i.e.*, can be used in, ‘automotive air conditioning systems and devices.’” *Id.* at 27 (quoting Ex. 1001, 7:38–43; citing Ex. 2126 ¶¶ 58–65). “That phrase alone,” Patent Owner contends, “would tell a skilled artisan that the inventors possessed methods and compositions for automobile air conditioning.” *Id.* (citing Ex. 2126 ¶¶ 58–65).

Patent Owner further contends that an ordinarily skilled artisan would “immediately recognize” its possession of the use of an HFO-1234yf/PAG combination in AAC. *Id.* at 28 (citing Ex. 2126 ¶ 64). Specifically, Patent Owner asserts that the written description “makes clear that the skilled artisan need not necessarily adapt existing refrigeration systems, including automobile air conditioning systems, to use the HFO-1234yf/PAG combination.” *Id.* at 27–28. Patent Owner also points out that the written description highlights that the inventive compositions can be used as “replacements for existing refrigerants, such as HFC-134a.” *Id.* at 27 (quoting Ex. 1001, 7:16–20 (emphasis and alteration omitted)). And, Patent Owner asserts, HFC-134a was “the most widely used automobile air conditioning refrigerant in 2002.” *Id.* (citing Ex. 2126 ¶¶ 58–65; Ex. 2049,¹⁵ 268:14–269:1). “To show the inventors possessed claim 1,” Patent Owner concludes, “requires no more.” *Id.*

¹⁵ Transcript of Cross-Examination of J. Steven Brown, Ph.D., Vol. I (Dec. 8, 2016).

(2) *Analysis*

(i) *Nature and Scope of the Claims*

We start with the claims. As discussed above, to be subject to the first-inventor-to-file provisions of the AIA and eligible for post-grant review, the '017 patent need only contain one claim that was not disclosed in compliance with § 112(a) in the '525 application. Thus, we exercise our discretion to focus our analysis on illustrative claim 1,¹⁶ and whether it finds adequate support in the written description of the '525 application.

Claim 1 recites a method for producing an AAC system comprising, *inter alia*, the step of providing a heat-transfer composition consisting essentially of at least 50% by weight of HFO-1234yf, which is a “low toxicity refrigerant suitable for use” in AAC, and PAG as a lubricant. See Ex. 1001, 17:34–55. As an initial matter, Patent Owner argues that the '017 patent's claims “do not require much for their practice.” PGR 12 Resp. 29. Patent Owner continues:

They impose no technically onerous requirements for *how* the claimed compositions are to be used in an automobile air conditioner. Instead, they require merely using HFO-1234yf and PAG as a heat transfer composition in an automobile air conditioner.

¹⁶ “[E]ntitlement to priority is decided on a claim-by-claim basis, and various claims may be entitled to different priority dates.” *X2Y Attenuators, LLC v. Int’l Trade Comm’n*, 757 F.3d 1358, 1366 (Fed. Cir. 2014). In this case, however, Patent Owner does not argue that claims 2–20 have an effective filing date that is different than the effective filing date of claim 1. That is, Patent Owner addresses claims 1–20 as though all the claims have the same effective filing date. Thus, claims 2–20 stand or fall with claim 1 as to effective filing date and post-grant review eligibility.

Id. (citing Ex. 1001, 17:35–55, 18:1–17, 18:34–35, 19:1–19; Ex. 2126 ¶¶ 53–54). For this reason, Patent Owner argues, it “need not have included in the [’525 application] the well-known details of how to use the claimed compositions in automobile air conditioning to provide written description support for such straightforward claims.” *Id.* at 29–30.

We disagree with Patent Owner’s proposition that a lack of detail in the claims excuses Patent Owner’s obligation to provide a written description conveying possession of a heat-transfer composition consisting essentially of HFO-1234yf and PAG for AAC. The written description of the ’525 application must show that Patent Owner “possessed the claimed methods by sufficiently disclosing” a method for providing a heat-transfer composition for AAC consisting essentially of HFO-1234yf and PAG, so as to “satisfy the inventor’s obligation to disclose the technologic knowledge upon which the patent is based, and to demonstrate that the patentee was in possession of the invention that is claimed.” *Ariad*, 598 F.3d at 1355. This is especially true in this case, given that Patent Owner characterized the claimed invention during prosecution as “directed to a specific heat transfer application, namely automotive air conditioning, having a combination of stringent and unique technical requirements, including numerous properties and characteristics that are not predictable.” Ex. 1049, 6–7.

(ii) Complexity and Predictability of the Relevant Technology

We next turn to the field of AAC, and note that “[t]he public notice function of a patent and its prosecution history requires that a patentee be held to what he declares during the prosecution of his patent.” *Springs Window Fashions LP v. Novo Indus., L.P.*, 323 F.3d 989, 995 (Fed. Cir.

2003). Thus, we credit and rely on Patent Owner's statements made during prosecution that AAC represents "a distinct technical field within the broader, general field of heating and cooling applications." Ex. 1049, 7. We further find that, because AAC "has specific technical requirements as compared to other heating and cooling applications" (*id.* at 8–9), knowledge relevant to cooling applications such as stationary air conditioning does not necessarily translate to AAC (*id.*; *see also id.* at 12–13 (stating that "a skilled artisan would not conclude that a heat transfer fluid disclosed as suitable for heating or cooling generally would necessarily, or obviously, be suitable for use in automotive air conditioning"); Ex. 1050, 8–9 (stating that "a person of ordinary skill in the art would not simply expect that a material used as a refrigerant in applications other than automotive air conditioning would be useful in automotive air conditioning"))).

Next, considering the totality of the record—including the parties' respective arguments and evidence—we are persuaded that the field of AAC was an unpredictable art as of the April 29, 2004, filing date of the '525 application. We again credit Patent Owner's statements made during prosecution that the field of AAC was a "very unpredictable art," and that certain technical requirements of AAC were unpredictable. Ex. 1049, 13, 22.

As to the latter, Patent Owner made several statements during prosecution about the "specific technical requirements" associated with AAC, including: (1) strict prohibitions on the use of toxic refrigerant materials "due to the confined, sealed, low volume air space" in AAC; (2) strict restrictions on compressor size, which, in turn, "plac[e] restrictions

on refrigerant capacity and COP”; (3) the ability to effectively operate at high condenser temperatures that form “in the heat-trapping engine compartment;” (4) restrictions on refrigerant flammability “due to the confined, sealed, low volume air space” in AAC; and (5) high stability “in view of the need for the use of flexible hoses” in AAC. *Id.* at 7–8; *see also* Ex. 1050, 8–9. We also credit and rely on Patent Owner’s statements that these specific technical requirements “necessarily have a significant impact” and “increase the difficulty and unpredictability of choosing an effective heat transfer fluid” for AAC. Ex. 1049, 12.

We further credit and rely on Patent Owner’s statements during prosecution that these specific characteristics of the combination of HFO-1234yf with PAG—low flammability, superior stability, low toxicity, and miscibility—were unpredictable and unexpected. *Id.* at 20–25. Such statements are consistent with Patent Owner’s arguments in this case. *See, e.g.*, PGR11 Resp. 34–54 (arguing that the ordinarily skilled artisan would have expected the combination of HFO-1234yf and PAG to be chemically unstable and unusable in AAC due to instability, toxicity, flammability, and immiscibility).

Patent Owner’s prosecution statements also are consistent with its expert testimony in this case. *See* Ex. 2001 (Dr. Bivens) ¶ 14 (stating that, in order to find a refrigerant for use in AAC, “researchers had to contend with a complex matrix of required and unpredictable properties”); PGR11 Ex. 2126 (Dr. Bivens) ¶ 75 (“[t]he miscibility of any two compounds is unpredictable”); *id.* ¶ 83 (“a person of skill in the art would have not had any reasonable expectation of success in combining HFO-1234yf with a PAG

lubricant and then successfully using that combination in automotive air conditioning”); *id.* ¶ 181 (“the combination of the claimed HFO-1234yf and a PAG lubricant demonstrates both unexpected stability and unexpected miscibility”); Ex. 2094 (Dr. Whittaker) ¶ 19 (testifying that an ordinarily skilled artisan “would not have had a reasonable expectation that [HFO]-1234yf would be low in toxicity”); *id.* ¶ 36 (stating that an ordinarily skilled artisan “would be uncertain, if not reasonably skeptical, of the usefulness of [HFO]-1234yf as a refrigerant that was likely to be safe for use in automotive air conditioning”).

“[P]redictability is a factual issue judged on a case-by-case basis.” *Synthes USA, LLC v. Spinal Kinetics, Inc.*, 734 F.3d 1332, 1344 (Fed. Cir. 2013). And, although there are no bright-line rules for the amount of disclosure needed in an unpredictable art, that amount “necessarily changes with each invention” and “changes with progress in the field.” *Ariad*, 598 F.3d at 1351. Here, we find that the art of AAC was unpredictable and that a heat-transfer composition for AAC required specific technical features that were unpredictable and unexpected. Thus, we conclude that the ’525 application requires a more-detailed disclosure than would be required in a predictable field to adequately demonstrate possession of a heat-transfer composition consisting essentially of HFO-1234yf and PAG for use in AAC.

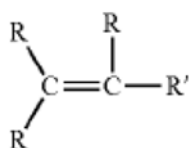
(iii) *Disclosure in the ’525 Application*

With these background findings in mind, we now turn to the four corners of the ’525 application—and we find that the ’525 application does not contain the detailed disclosure needed in this case to reasonably convey possession of a heat-transfer composition consisting essentially of HFO-

1234yf and PAG for use in AAC.

The '525 application discloses “compositions comprising one or more C3 or C4 fluoroalkenes, preferably compounds having Formula I.”

Ex. 1001, 3:40–50. Formula I is disclosed as “ $\text{XC}_z\text{FR}_{3-z}$ ” “where X is a C_2 or a C_3 unsaturated, substituted or unsubstituted, alkyl radical, each R is independently Cl, F, Br, I or H, and z is 1 to 3.” *Id.* We credit Dr. Brown’s uncontested testimony that Formula I encompasses over 100,000 compounds. Ex. 1002 ¶ 160. The '525 application then discloses “preferred embodiments,” which are compounds of Formula II, depicted below:



(II)

“where each R is independently Cl, F, Br, I or H[,] R’ is $(\text{CR}_2)_n\text{Y}$, Y is CRF_2 [,] and n is 0 or 1.” Ex. 1001, 4:10–21. Again, we credit Dr. Brown’s uncontested testimony that Formula II encompasses “tens of thousands of potential compounds.” Ex. 1002 ¶ 161.

The '525 application narrows the genus of Formula I and II compounds in a stepwise fashion. *First*, the written description states that “applicants have surprisingly and unexpectedly found that *certain* of the compounds having a structure in accordance with the[se] formulas . . . exhibit a highly desirable low level of toxicity compared to other such compounds” of Formulas I and II. *Id.* at 4:29–33 (emphases added). *Second*, the written description identifies those compounds of Formula II, *preferably* wherein Y is CF_3 , wherein at least one R on the unsaturated

terminal carbon is H, and at least one of the remaining R [groups] is F.” *Id.* at 4:38–42 (emphasis added). *Third*, the ’525 application states that in “*highly preferred embodiments*,” “n is zero” and “the unsaturated terminal carbon has not more than one F substituent.” *Id.* at 4:45–48 (emphasis added). And *fourth*, the ’525 patent states that, in “*certain highly preferred embodiments*,” the compositions “comprise one or more tetrafluoropropenes” (referred to as “HFO-1234”). *Id.* at 4:50–54.

Among the tetrafluoropropenes, the ’525 application specifically identifies HFO-1234ze (cis- and trans-1,3,3,3-tetrafluoropropene) as “particularly preferred.” *Id.* at 4:54–63. We find that the overwhelming majority of the ’525 application describes HFO-1234ze; indeed, it is the only tetrafluoropropene provided by name in the “Detailed Description of the Preferred Embodiments,” see Ex. 1001, 3:60–13:55 (referring to HFO-1234ze in the context of “preferred” in at least 10 instances), and it is the only compound identified by name in “Heat Transfer Compositions,” *id.* at 6:40–42 (stating that “[i]n many embodiments, it is preferred that the heat transfer compositions of the present invention comprise transHFO-1234ze”); Ex. 1002 ¶ 162. Thus, we find that HFO-1234ze is the clearly preferred compound in the ’525 application. And, although we agree with Patent Owner that this fact is not dispositive, see PGR12 Resp. 36, we take it into consideration when weighing all the evidence.

We find that HFO-1234yf is specifically mentioned in two places in the ’525 application—in Table 1 of Example 1 as a “preferred compound,” Ex. 1001, 14:34–36, and in Example 5 as a “preferred embodiment,” *id.* at 16:65–66. We are not persuaded, however, by Dr. Bivens’ testimony that

the '525 application conveys to the skilled artisan that HFO-1234yf is just one of “three possible highly preferred tetrafluoropropenes.” See Ex. 2001 ¶¶ 28–31 (quotation omitted). We find that Dr. Bivens reaches this conclusion by reading the “Compositions” section of the '525 application backward.

First, Dr. Bivens relies on the '525 application's sentence that “‘certain highly preferred embodiments’ are ‘tetrafluoropropenes’” to set forth “seven possible tetrafluoropropenes: transHFO-1234ze, cisHFO-1234ze, HFO-1234yf, HFO-1234yc, HFO-1234zc, transHFO-1234ye, and cisHFO-1234ye.” *Id.* ¶ 29 (citing Ex. 1001, 4:50–52).¹⁷ Dr. Bivens immediately eliminates HFO-1234yc because it does not fit within Formula II. *Id.* Next, Dr. Bivens narrows that group of six to five possible tetrafluoropropenes, by testifying that:

The '451 patent *then* explains that “certain of the compounds having a structure in accordance with the formulas described above exhibit a highly desirable low level of toxicity,” and explains that such low toxicity compounds are those “wherein at least one R on the unsaturated terminal carbon is H.” This further limits the number of possible tetrafluoropropenes to five possible compounds, as HFO-1234zc does not have a hydrogen on the unsaturated terminal carbon.

Id. ¶ 30 (emphasis added) (citing Ex. 1001, 4:29–42).

The problem we find with Dr. Bivens' analysis, however, is that the written description of the '525 application does not “*then*” narrow the six

¹⁷ For ease of reference, we have converted Dr. Bivens' column and line citations to Ex. 1021 (the '451 patent) to their corresponding column and line citations in Ex. 1001 (representing the '525 application).

possible tetrafluoropropenes to five. Instead, the '525 application narrows the genus of Formula II compounds in a specific, stepwise fashion, as described above. It is unclear to us from Dr. Bivens' declaration that following the stepwise pattern the '525 application describes would result in the same genus of five tetrafluoropropenes.

Nevertheless, Dr. Bivens then further narrows his genus of five tetrafluoropropenes to three. Specifically, Dr. Bivens testifies that "[t]he '451 patent *then further* limits the possible compounds" to "three possible highly preferred tetrafluoropropenes: transHFO-1234ze, cisHFO-1234ze, and HFO-1234yf," by providing that "Y is CF₃, n is 0 and at least one of the remaining Rs is F." Ex. 2001 ¶ 31 (emphasis added) (citing Ex. 1001, 4:22–23). But again, this sentence of the '525 application appears immediately *after* the description of Formula II and *before* the description of tetrafluoropropenes. Thus, it is unclear whether narrowing the compounds of Formula II to those in which "Y is CF₃, n is 0 and at least one of the remaining Rs is F," would result in the same genus of compounds when tetrafluoropropenes are narrowed to those in which "Y is CF₃, n is 0 and at least one of the remaining Rs is F."

Put differently, it appears to us that Dr. Bivens arrives at his "three possible tetrafluoropropenes" by starting with a small genus of tetrafluoropropenes and working backwards to narrow down that genus, instead of working stepwise from Formula II and narrowing that genus to tetrafluoropropenes, as the '525 application instructs. Ex. 1001, 4:6–63. Indeed, we note that Dr. Bivens acknowledged in his deposition testimony that compounds *other* than his initial seven tetrafluoropropenes would fall

within the definition of “highly preferred embodiments,” immediately following the description of Formula II in the ’525 application. *See* Ex. 1177,¹⁸ 158:21–159:25 (agreeing that R-1225 falls within the highly preferred embodiments described in the ’525 application where Y is CF₃, n is 0 and at least one of the remaining R groups is F).

Thus, although HFO-1234yf is certainly listed as a “preferred embodiment” in the ’525 application (*id.* at 16:65–66), we are not persuaded that it is one of three “highly preferred” compounds, along with the clearly contemplated cis- and trans-HFO1234ze compounds, as Patent Owner contends. *See Novozymes A/S v. DuPont Nutrition Biosciences APS*, 723 F.3d 1336, 1349 (Fed. Cir. 2013) (characterizing patentee’s attempt to “work[] backward from a knowledge of the claims” as “hindsight” that merely “derive[s] written description support from an amalgam of disclosures plucked selectively from the . . . application” (quotation and alteration omitted)).

As with HFO-1234yf, the actual disclosure of AAC in the ’525 application is scarce. In fact, the ’525 application only mentions AAC once:

The present methods, systems and compositions are thus *adaptable for use* in connection with *automotive air conditioning systems and devices*, commercial refrigeration systems and devices, chillers, residential refrigerator and freezers, general air conditioning systems, heat pumps, and the like.

Ex. 1001, 7:38–43 (emphases added). The parties disagree about the meaning of “adaptable for use.” Petitioner asserts that “adaptable for use” provides a “mere wish or plan” for obtaining a heat-transfer composition for

¹⁸ Deposition of Dr. Donald Bivens (March 2, 2017).

AAC, given Patent Owner’s “repeated representations . . . that AAC is a ‘distinct technical field’ having ‘specific technical requirements as compared to other heating and cooling applications, including stationary air conditioning.’” PGR12 Pet. 26 (quoting Ex. 1049, 7; citing *id.* at 12; Ex. 1050, 8–9; Ex. 1002 ¶ 241). Patent Owner, on the other hand, asserts that “adaptable for use” means that the compositions “can be used in” AAC. PGR12 Resp. 27 (citing PGR12 Ex. 2126 ¶¶ 58–65).

We agree with Petitioner that the ’525 application’s statement that the compounds are “adaptable for use” weighs against a finding of adequate written description. First, “adaptable for use” is vague, as Dr. Bivens acknowledges. *See* Ex. 1177, 151:15 (testifying that “adaptable for use can have a wide range of meaning”). Second, the ’525 application gives no direction on how a skilled artisan would need to adapt any particular composition for use in AAC, or even if any “adaptation” was necessary. We find that such a teaching is important in this case to show that the inventors had possession of the claimed invention, given our findings above that the art of AAC was unpredictable and that a heat-transfer composition for AAC required specific technical features that were unpredictable and unexpected.

For completeness, we again reject Patent Owner’s argument that “[t]o show the inventors possessed claim 1 requires no more” than the statement in the written description that “‘the compositions of the present invention are believed to be adaptable . . . *with or without system modification.*’” PGR12 Resp. 27–28 (quoting Ex. 1001, 7:4–8). Regardless of the exact wording of claim 1, the inventors “still [had to have] describe[d] some way of performing the claimed methods.” *Ariad*, 598 F.3d at 1355. And here, with

merely a passing reference to AAC, the '525 application fails to provide any credible “technologic knowledge” to demonstrate to an ordinarily skilled artisan that Patent Owner “was in possession of the invention that is claimed.” *Id.*

Thus, considering the evidence as a whole, we agree with Petitioner that the reference to AAC in the '525 application constitutes only a “passing reference,” or a “mere wish or plan” for obtaining the claimed invention. PGR12 Pet. 26; *see also* Ex. 1002 ¶ 241 (Dr. Brown’s testimony that the '525 application “provides no guidance on what adaptation is needed for any of the specified applications, much less AAC, or how the adaptation would be the same or different depending on the application.” (quotations and alterations omitted)); Ex. 2001 ¶ 14 (Dr. Bivens’ testimony that automobile air conditioning involves a “complex matrix of required and unpredictable properties”). Indeed, given the “specific technical requirements” necessary for a heat-transfer composition in AAC, we find that the '525 application merely “lead[s] one to speculate as to modifications that the inventor might have envisioned, but failed to disclose.” *Lockwood*, 107 F.3d at 1571–72.

(iv) *Special Technical Requirements of AAC Heat-Transfer Compositions*

During prosecution, Patent Owner argued that the ordinarily skilled artisan would not have expected the combination of HFO-1234yf and PAG to be usable in AAC because an ordinarily skilled artisan could not predict the stability, toxicity, flammability, and miscibility of such a composition. Ex. 1049, 20–25. We find that the '525 application discloses no credible information as to any of these special technical requirements, and that this fact weighs against a finding of adequate written description. Without such

information, an ordinarily skilled artisan would not have recognized from the '525 application that HFO-1234yf and PAG could be used in AAC. That inadequacy in the disclosure, in turn, supports Petitioner's view that the inventors were not in possession of the claimed invention at the time of filing of the '525 application. *See Ariad*, 598 F.3d at 1351 (stating that the specification must "describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed.").

For example, the written description discloses no credible information about the low flammability of HFO-1234yf—a critical feature of an AAC heat-transfer composition. Ex. 1049, 7–8, 14. Dr. Bivens acknowledged on cross examination that an ordinarily skilled artisan would have needed at least some information about flammability before determining how to adapt a compound for a specific refrigerant application. Ex. 1177, 164:24–165:6.

Acceptable miscibility is another critical property of a heat-transfer composition for AAC—but, again, that property for HFO-1234yf and PAG is not disclosed in the '525 application. Ex. 2001 ¶¶ 14, 18. Specifically, Example 2 of the '525 application provides the miscibility of HFO-1225ye and HFO-1234ze with various lubricants, including PAG, but does not provide any credible guidance on the miscibility of HFO-1234yf with PAG. Ex. 1001, 14:47–15:13. Given Dr. Bivens' testimony that the miscibility of any two compounds is unpredictable, Ex. 2001 ¶ 59, we agree with Petitioner that an ordinarily skilled artisan would not "extrapolate these tests on *other* refrigerants to HFO-1234yf," PGR12 Reply 16–17. The lack of disclosure of miscibility data, relating to the claimed heat-transfer composition for AAC, supports Petitioner's position that the inventors were

not in possession of that composition for use in AAC at the time of filing the '525 application.

We also find that the written description of the '525 application provides no credible guidance on the stability of HFO-1234yf and PAG. Example 3 tests the stability of compounds other than HFO-1234yf with PAG in contact with metal tubes. *See* Ex. 1001, 15:15–43. But again, this test tells the skilled artisan nothing about stability in an AAC system, even though Patent Owner argued during prosecution that “the refrigerant used in [AAC] must be compatible” with the flexible hoses used in AAC systems—a “more difficult compatibility requirement[] than the metal hosing used in stationary systems.” Ex. 1050, 19–20. We agree with and credit Dr. Brown’s testimony that an ordinarily skilled artisan would have understood Example 3 as disclosing stationary air-conditioning systems rather than AAC. Ex. 1002 ¶ 244.

Finally, we are particularly troubled by the lack of any credible, detailed information about the toxicity of HFO-1234yf in the '525 application. Patent Owner argued during prosecution that “[AAC] systems create specific toxicity constraints distinct from and much more stringent than other heating and cooling applications” (Ex. 1049, 12–13), and that “the Examiner [has] acknowledged that toxicity is a more important consideration in automotive air conditioning than in other refrigeration applications” (Ex. 1050, 7). But the '525 application contains no credible information about the toxicity of a heat-transfer composition for AAC consisting essentially of HFO-1234yf and PAG. Indeed, the '525 application states that “applicants have surprisingly and unexpectedly found

that *certain* of the compounds having a structure in accordance with” Formulas I and II “exhibit a highly desirable low level of toxicity compared to *other such* compounds” of Formulas I and II, Ex. 1001, 4:29–33 (emphases added), but only specifically names HFO-1234ze as a compound having this “low level of toxicity,” *id.* at 4:45–63. This lack of disclosure further supports a finding that the inventors lacked possession of a heat-transfer composition for AAC consisting essentially of HFO-1234yf and PAG.

We also find that a more-detailed disclosure of toxicity information in the ’525 application was needed to show possession, in view of Dr. Whittaker’s testimony that an ordinarily skilled artisan would not have reasonably expected HFO-1234yf to have low toxicity “given the lack of toxicology data, the unknown mechanisms of toxicity of [HFO]-1234yf and related fluoroalkenes, and the unpredictability in toxicity reported for fluoroalkenes in the published literature prior to October 25, 2002.” PGR11 Ex. 2094 ¶ 30. Even though we acknowledge that Dr. Whittaker couches her testimony in terms of the knowledge in the art as of 2002, we find that the ’525 application fails to contribute in any significant way to that knowledge. Indeed, the ’525 application contains much less toxicology information than the “bare minimum” Dr. Whittaker testified would be required to demonstrate HFO-1234yf’s safety for AAC. Ex. 1176,¹⁹ 153:21–155:21.

¹⁹ Deposition of Margaret H. Whittaker, Ph.D. (Feb. 16, 2016).

At most, therefore, we find that the '525 patent invites the ordinarily skilled artisan to experiment to determine which compounds other than HFO-1234ze would have had appropriate stability, toxicity, flammability, and miscibility to be suitable for AAC. Patent Owner argues that the '525 application need not disclose this information, because each technical requirement represents an “inherent disclosure.” PGR12 Resp. 49–50. But the Federal Circuit has rejected this argument: “An invitation to investigate is not an inherent disclosure.” *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1367 (Fed. Cir. 2004).

(v) *Example 1*

We next analyze the parties' respective arguments about what a skilled artisan would understand about the combination of HFO-1234yf and PAG for use in AAC from Example 1 of the '525 application. As explained above, Example 1 is directed to “[a] refrigeration/air conditioning cycle system.” Ex. 1001, 14:16–18. Table 1 provides the relative COP, relative capacity, and discharge temperatures for “several compositions of the present invention,” as compared to “HFC-134a having a COP value of 1.00, a capacity value of 1.00[,] and a discharge temperature of 175°F.” *Id.* at 14:20–24.

We reproduce Table 1 again here for ease of reference:

TABLE I

REFRIGERANT COMPOSITION	Relative COP	Relative CAPACITY	DISCHARGE TEMPERATURE (° F.)
HFO 1225ye	1.02	0.76	158
HFO trans-1234ze	1.04	0.70	165
HFO cis-1234ze	1.13	0.36	155
HFO 1234yf	0.98	1.10	168

Id. at 14:25–35. The written description states that “[t]his example shows that *certain of the preferred compounds* for use with the present compositions each have a better energy efficiency than HFC-134a (1.02, 1.04 and 1.13 compared to 1.00).” *Id.* at 14:36–39 (emphasis added). And the written description states that “the compressor using the present refrigerant compositions will produce discharge temperatures (158, 165 and 155 compared to 175), which is advantageous since such result will likely leading [sic] to reduced maintenance problems.” *Id.* at 14:39–43.

The parties vigorously disagree about the import of Example 1. Petitioner contends that an ordinarily skilled artisan would not have understood Example 1 as demonstrating possession of the claimed subject matter because Example 1 is not an example of an AAC system. PGR12 Reply 6–11; *see also* Ex. 1002 ¶ 171. Petitioner also contends that Example 1, although including data on four refrigerants—including HFO-1234yf—only discusses the results of the HFO-1225ye and *cis*- and *trans*-HFO-1234ze refrigerants. PGR12 Reply 9. Petitioner reasons that the ordinarily skilled artisan reading Example 1 would have understood that a relative COP

of greater than 1 was required, and that HFO-1234yf was intentionally excluded because it had a reported COP of less than 1 and therefore would not have provided the “competitive advantage of an energy basis.” *Id.*

Patent Owner contends that a skilled artisan would have recognized from Example 1 that HFO-1234yf was indeed usable in AAC and could be used as a “near drop-in” replacement for HFC-134a. PGR12 Resp. 28–29, 37–39, 44–45 (citing PGR12 Ex. 2126 ¶¶ 41–46). In particular, Patent Owner contends that the data presented in Example 1 would have demonstrated to one of ordinary skill in the art that HFO-1234yf could be used in an automobile air conditioner because of the higher relative capacity of HFO-1234yf and a relative COP of almost 1. *Id.* at 26–27.

Having reviewed the evidence and arguments, we agree with Petitioner that, at most, Example 1 would have rendered the use of an AAC heat-transfer composition consisting essentially of HFO-1234yf obvious. PGR12 Reply 4–5. But a description that merely renders the invention obvious does not satisfy the written description requirement. *Ariad*, 598 F.3d at 1352; *see also Lockwood*, 107 F.3d at 1571–72.

As an initial matter, we find that there is no real dispute that Example 1 “is not an example of an automobile air-conditioning system.” *See* Ex. 1068²⁰ ¶ 11.28 (statement to the European Patent Office that Example 1 of WO 2004/037913—which is identical to Example 1 of the ’017 patent—“is not an example of an automobile air-conditioning system”); *see also* Tr.

²⁰ Patent Owner’s Submission in EPO Opposition of EP 1 716 216 B1 to Singh et al. (Dec. 20, 2010).

69:2–3. Thus, the '525 application does not actually disclose HFO-1234yf in an AAC system.

Even so, we agree with Petitioner that, as a matter of law, Example 1 does not reasonably convey possession of HFO-1234yf. That is because, regardless of parties' disagreements about COP and relative capacity, Example 1, at most, *suggests* to the ordinarily skilled artisan to consider using HFO-1234yf as a drop-in replacement for HFC-134a as a general refrigerant; it does not *show* that the inventors actually possessed a heat-transfer composition for AAC consisting essentially of HFO-1234yf and PAG. *See Lockwood*, 107 F.3d at 1571–72 (“One shows that one is ‘in possession’ of *the invention* by describing *the invention* . . .”). We find that Dr. Bivens' testimony that “[t]he skilled artisan would recognize that . . . a tradeoff [between COP and capacity] would be favorable under certain circumstances, particularly in finding a ‘drop-in’ or ‘near drop-in’ replacement” for AAC, Ex. 2001 ¶ 33, supports our view. “Weighing tradeoffs” tells us what the written description *suggests* to the ordinarily skilled artisan, not what the written description actually *describes* to the ordinarily skilled artisan. *See Lockwood*, 107 F.3d at 1572 (stating that the written-description requirement is not met by combining the actual disclosure with knowledge in the art); *see also Rivera v. Int’l Trade Comm’n*, 857 F.3d 1315, 1322–23 (Fed. Cir. 2017) (rejecting patent owner’s assertion that “background knowledge of those skilled in the art can supplement the teaching in the specification to provide written description support”).

Finally, we reject Dr. Bivens’ statement that Patent Owner “conflates the technical specifics of how to use a refrigerant in automobile air conditioning . . . with the unexpected discovery that the compositions of the claimed invention can be used in automobile air conditioning.” PGR11 Ex. 2126 ¶ 64. Although we agree, on this record, that the discovery that HFO-1234yf could be used as a heat-transfer composition in AAC was unexpected, we do not agree that the individual and passing references to AAC, PAG, and HFO-1234yf in the ’525 application reasonably show that the inventors actually possessed this discovery—particularly where the sole reference to AAC in the written description includes a statement that the disclosed compositions may be adaptable for use in AAC and the disclosure lacks any credible and specific details as to stability, toxicity, flammability, and miscibility. *See* Ex. 1001, 7:38–43; Ex. 1049, 20–25; *see also Lockwood*, 107 F.3d at 1571 (“It is the disclosures of the applications that count.”); *Enzo Biochem, Inc. v. Gen-Probe Inc.*, 285 F.3d 1013, 1022 (Fed. Cir.) (“The written description requirement is not satisfied by what could have been disclosed, but was not.”), *vacated on reh’g*, 323 F.3d 965 (Fed. Cir. 2002) ; *Purdue Pharma L.P. v. Recro Tech., LLC*, No. 2016-2260, 2017 WL 2547306, at *4 (Fed. Cir. June 13, 2017) (non-precedential) (“To the extent that [patent owner] contends that a person of skill in the art would isolate and combine aspects from various embodiments in the specifications (including patents incorporated by reference involving a different drug) to obtain the claimed invention, [patent owner] relies upon the wrong test.”).

(3) Conclusion

Based on our review of the parties' arguments and the evidence, we find that the '525 application fails to provide sufficient written-description support for the subject matter of claim 1 of the '017 patent. In particular, upon weighing the evidence, we credit Dr. Brown's testimony that the '525 application does not reasonably convey to the skilled artisan that the inventors possessed a heat-transfer composition consisting essentially of HFO-1234yf and PAG for AAC. Ex. 2001 ¶¶ 235, 239–245.²¹

(b) The '017 Patent Is Eligible for Post-Grant Review

For the reasons set forth above, we determine that Petitioner has demonstrated by a preponderance of the evidence that claim 1 of the '017 patent has an effective filing date of March 26, 2014. Therefore, the '017 patent is eligible for post grant review. AIA § 6(f)(2)(A).

D. Unpatentability Challenges

To prevail in challenging claims 1–20 of the '017 patent, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). “[T]he petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); *see also* 35 U.S.C. § 322(a)(3) (requiring post-grant review petitions to identify “with particularity . . . the evidence that

²¹ We find it unnecessary to address Petitioner's incorporation-by-reference arguments, because Patent Owner does not rely in its Response on any application filed before the '525 application as evidence of adequate written description. *See* PGR12 Resp. 57–58.

supports the grounds for the challenge to each claim”). That burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015); *see also In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1375–78 (Fed. Cir. 2016) (discussing the burden of proof in AIA trials).

1. Unpatentability Based on Prior Use

Section 102(a) provides that “[a] person shall be entitled to a patent unless . . . the claimed invention was . . . in public use . . . before the effective filing date of the claimed invention.” 35 U.S.C. § 102(a)(1). “The proper test for the public use prong . . . is whether the purported use was accessible to the public or was commercially exploited.” *Delano Farms Co. v. Cal. Table Grape Comm’n*, 778 F.3d 1243, 1247 (Fed. Cir. 2015) (quotation omitted). “Commercial exploitation is a clear indication of public use” *Invitrogen Corp. v. Biocrest Mfg., L.P.*, 424 F.3d 1374, 1380 (Fed. Cir. 2005).

Petitioner argues that “[t]here can be no doubt that the subject matter of the ’017 patent claims . . . was already in commercial use prior to the March 26, 2014, filing date.” PGR12 Pet. 37. Specifically, Petitioner states that four vehicle models—the Ford Transit Custom Bus, the Mazda CX5 (2.0i and 2.2D models), and the Opel Mokka—all used HFO-1234yf and a PAG lubricant as early as 2012. *Id.* at 38. Petitioner asserts that these public uses anticipate claims 1–20 of the ’017 patent. *Id.*

Patent Owner does not directly address Petitioner’s evidence of prior public use, but instead relies on its argument that the claims of the ’017 patent are entitled to priority to the April 29, 2004, filing date of the ’525

application. PGR12 Resp. 61. Patent Owner also does not argue that 2-20 have a different effective filing date than claim 1.²² And, at oral argument, Patent Owner's counsel conceded that, if we find that the '017 patent has an effective filing date of March 26, 2014, then its claims would be unpatentable for prior public use:

JUDGE TIERNEY: I do have a couple of questions just before – when we go ahead and decide this case and write it up, I'm looking at the PGR2016-0012 case . . . if we hold that the claims do not get benefit of the earlier date and it's limited to its 2014 date, do we need to go into discussion of the art at this time? I'm looking at the response.

MR. LOCASCIO: No, you don't, because it's Honeywell's own work, so *it's no stunner that Honeywell's own work years after their priority date and they came up with this would invalidate*, so no.

JUDGE TIERNEY: And turning over to PGR2016-0011, similar question, if Honeywell is limited to a 2014 date, would we need to go through and discuss the art? Because then it's –

MR. LOCASCIO: I think [it] would be moot at that time, *because under the PGR12, that art would, I think by all acknowledgments, then be covered by the claims and invalidate [them]*

Tr. 114:15–115:18 (emphases added). Thus, we find that Patent Owner does not contest that a heat-transfer composition consisting essentially of HFO-

²² Patent Owner's contention that it is entitled to an earlier priority date here stands or falls with the entitlement to the '525 application priority date. For the reasons provided above, we find that claims 1–20 are limited to the actual filing date of the '588 application, i.e., March 26, 2014.

1234yf and PAG for AAC was in public commercial use before the March 26, 2014, filing date of the '017 patent.

Accordingly, we find that Petitioner's evidence, together with Patent Owner's concessions, demonstrates by a preponderance of evidence that the claimed subject matter of the '017 patent was in commercial use before its March 26, 2014, effective filing date. See Ex. 1002 ¶¶ 399–409. In particular, as to claims 1, 3–10, 12, 13, and 15–20, we credit Dr. Brown's uncontested testimony that the refrigerant-lubricant AAC composition of the Ford Transit Custom Bus, the Mazda CX 5 (2.0i and 2.2D), and the Opel Mokka used HFO-1234yf and a PAG lubricant as early as 2012. Ex. 1002 ¶ 399 (citing Ex. 1013²³, 2, 38, 55, 70). We also credit Dr. Brown's calculations, which show that the Ford Transit Custom Bus had an AAC refrigerant-lubricant composition of 26.7% of PAG lubricant and 73.3% of HFO-1234yf (Ex. 1002 ¶ 401 (citing Ex. 1013, 38)); the Mazda CX 5 2.0i had 16.7% PAG lubricant and 83.3% HFO-1234yf (Ex. 1002 ¶ 402 (citing Ex. 1013, 55)); the Mazda CX 5 2.2D had a 17.5% PAG lubricant and 82.5% HFO-1234yf (*id.*); and the Opel Mokka had 11.6% PAG lubricant and

²³ Behr Hella Services, *Refrigerant and Oil Filling Quantities Passenger Cars & Commercial Vehicles 2014–15*. PGR12 Ex. 1013. ("Service Guide"). PGR12 Ex. 1013. The Service Guide provides tables setting forth specifications for refrigerant type, refrigerant quantity, vehicle manufacturers' original equipment compressor oil type, and oil filling quantity for the air-conditioning system of each vehicle listed in the tables. *Id.* at 2–3. Petitioner and Dr. Brown direct us to the Service Guide's entries for the Ford Transit Custom Bus, the Mazda CX 5 (2.0i and 2.2D model), and the Opel Mokka. Pet. 38; Ex. 1001 ¶ 399. Petitioner uses the Service Guide as evidence of the AAC compositions used in those models before 2014.

88.4% HFO-1234yf (Ex. 1002 ¶ 402 (citing Ex. 1013, 70)). As to dependent claims 2, 11, and 14, which all require that the lubricant is present “in an amount from about 30% to about 50% weight,” we credit Dr. Brown’s uncontested testimony that the refrigerant-lubricant composition of the Ford Transit Custom Bus recited lubricant amount. Ex. 1002 ¶ 403. In particular, we agree with Dr. Brown that, because the lubricant accounts for 26.7% of the AAC refrigerant-lubricant composition in the Ford Transit Custom Bus, the lubricant makes up “about 30%” of the refrigerant-lubricant composition as claimed. *Id.*

For these reasons, we find that Petitioner has met its burden to show that claims 1–20 are unpatentable for anticipation under § 102(a)(1).

2. Remaining Unpatentability Grounds

Having determined that claims 1–20 are unpatentable for prior public use, we need not reach the additional anticipation, obviousness, and enablement challenges to the claims as they are moot.

E. Motions to Exclude Evidence

We now turn to the parties’ fully briefed motions to exclude certain evidence from the record in PGR11.

1. Petitioner’s Motion to Exclude Under 37 C.F.R. § 42.64

Petitioner moves to exclude Exhibits 2101, 2102, and 2103 as inadmissible hearsay under Federal Rules of Evidence (“FRE”) 801 and FRE 802. PGR11 Paper 36, 1–2. Exhibits 2101 and 2102 are Declarations of Richard Winick, and Exhibit 2103 is a Declaration of Raymond Thomas. Patent Owner submitted these declarations as evidence of secondary considerations of nonobviousness. *Id.* at 1. We do not rely on any of those

challenged Exhibits in this Decision. Thus, we *dismiss as moot* Petitioner's Motion to Exclude.

2. *Patent Owner's Motion to Exclude Under 37 C.F.R. § 42.64*

Patent Owner moves to exclude Exhibit 1163 as inadmissible hearsay under FRE 801 and FRE 802. PGR11 Paper 38, 1–2. Exhibit 1163 is a Declaration of Dr. Takashi Shibnuma. Dr. Shibnuma's Declaration relates to the prior-art reference Inagaki, which Petitioner relies upon in PGR11 to support its argument that the subject matter of the challenged claims would have been obvious. Pet. 2. We do not rely on this Exhibit in this Decision. Thus, we *dismiss as moot* Patent Owner's Motion to Exclude.

3. *Petitioner's Motion to Exclude Pursuant to Board Order*

Petitioner also moves to exclude Exhibits 2165 and 2166 as, *inter alia*, inadmissible hearsay under FRE 801 and FRE 802. PGR11 Paper 50, 4. Exhibit 2165 is a Declaration of Dr. Rajiv Singh and Exhibit 2166 is excerpts from a deposition testimony of Dr. Singh. Patent Owner submitted these documents as supplemental evidence to support admissibility of Exhibit 2103. *Id.* at 1. Because, as noted above, we do not rely on Exhibit 2103 in this Decision, we also do not rely on Exhibits 2165 and 2166. Thus, we *dismiss as moot* Petitioner's Motion to Exclude Pursuant to Board Order.

III. CONCLUSION

For the foregoing reasons, we conclude that Petitioner has shown by a preponderance of evidence that the '017 patent is subject to post-grant review and that all claims of the '017 are unpatentable under 35 U.S.C. § 102(a) for prior public use.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–20 of the '017 patent are held unpatentable;

FURTHER ORDERED that Petitioner's Motions to Exclude are
dismissed as moot;

FURTHER ORDERED that Patent Owner's Motion to Exclude is
dismissed as moot;

FURTHER ORDERED that any party seeking judicial review of this
decision must comply with the notice and service requirements of 37 C.F.R.
§ 90.2.

PGR2016-00011
PGR2016-00012
Patent 9,157,017 B2

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